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Interaction of natural survival instincts and internalized social norms exploring the Titanic and Lusitania disasters

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Interaction of natural survival instincts and internalized social norms exploring the Titanic and Lusitania disasters

Abstract:

To understand human behavior, it is important to know under what conditions people deviate from selfish rationality. This study explores the interaction of natural survival instincts and internalized social norms using data on the sinking of the *Titanic* and the *Lusitania*. We show that time pressure appears to be crucial when explaining behavior under extreme conditions of life and death. Even though the two vessels and the composition of their passengers were quite similar, the behavior of the individuals on board was dramatically different. On the *Lusitania*, selfish behavior dominated (which corresponds to the classical homo oeconomicus); on the *Titanic*, social norms and social status (class) dominated, which contradicts standard economics. This difference could be attributed to the fact that the *Lusitania* sank in 18 minutes, creating a situation in which the short-run flight impulse dominates behavior. On the slowly sinking *Titanic* (2 hours, 40 minutes), there was time for socially determined behavioral patterns to re-emerge. To our knowledge, this is the first time that these shipping disasters have been analyzed in a comparative manner with advanced statistical (econometric) techniques using individual data of the passengers and crew. Knowing human behavior under extreme conditions allows us to gain insights about how varied human behavior can be depending on differing external conditions.

Keywords: Tragic Events and Disasters; Survival; Decisions under Pressure; Altruism and Self-Interest.

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Introduction

On the night of 14 April 1912, the *Titanic* collided with an iceberg and sunk, resulting in the death of 1,517 people. Three years later, on 7 May 1915, the *Lusitania* was torpedoed by a German U-boat and sunk; 1,198 people died in this tragedy. We explore the interaction of survival instincts and the materialization of internalized social norms using data on these two disasters, both of which demonstrate a similar shortage of lifeboats and survival rates (around 30 percent), a comparable number of crew members in relation to passengers (around 40 percent) and similarities in passengers' socio-demographic and socio-economic structures (see *Table 1*). As the two maritime disasters occurred within three years of each other, one can also assume stable historical norms.

Table 1 about here

We believe, this is the first time that these arguably very well-known shipping disasters have been analyzed in a comparative manner with advanced statistical (econometric) techniques using individual data of the passengers and crew. The analysis provides innovative insights into the behavior of individuals under extreme conditions. Economics traditionally assumes that human beings behave in a rational and selfish way, which is shaped by external conditions (1, 2). Recent research has provided evidence that these assumptions do not always hold (3-5). Even though the two vessels and the composition of the passengers were quite similar, the behavior of

the individuals on board was dramatically different. On the *Lusitania*, selfish behavior prevailed (which corresponds to the classical homo oeconomicus), while on the *Titanic* the adherence to social norms and social status (class) dominated. This difference could be attributed to the fact that the *Lusitania* sank in only 18 minutes, creating a situation in which the short-run flight impulse dominates behavior; while on the slowly sinking *Titanic* (2 hours, 40 minutes), there was time for socially determined behavioral patterns to re-emerge. It also could be argued that the *Lusitania* was sunk during a time of war, which may provoke different reactions. For example, we may observe less risk-averse passengers on the *Lusitania*. Warning notices had been printed in the leading newspapers reminding transatlantic passengers that a state of war was in effect and any vessel travelling under the British flag was liable to destruction, and passengers sailed at their own risk. On the other hand, there are several reasonable suppositions supporting the idea that the *Lusitania* 'should' not have been at risk, primarily because it was capable of speeds fast enough to outrun enemy torpedoes. The *Lusitania* held the transatlantic Blue Riband award for speed, and it was a vessel carrying civilian passenger, not a warship. Finally, it was carrying a number of neutral American civilians. Maritime law states that in wartime merchant vessels must be given a warning prior to attack, whereas warships should not expect any warning. The *Lusitania* was never given such a warning by the attacking U-boat (6). The cargo was in general of the ordinary kind, but included a number of cases of cartridges (about 5'000). Contrary to German claims, the steamer carried no masked guns nor trained gunners, or special ammunition, nor was she transporting troops (7).

The likelihood that the passengers of the *Lusitania* knew about the tragic events of the sinking of the *Titanic* should not be excluded. For example, whereas many of the passengers on the *Titanic* may have (wrongly) believed that they would ultimately be rescued (8), those on the *Lusitania* may have learned from the experience of the *Titanic*. This may have led those passengers to change their behavior (increase in self-preserving behavior). Nevertheless, maritime disasters have similarities to quasi-natural experiments whose great advantage is randomization and realism (9-11). The disasters occurred due to an exogenous event, and the resulting life and death situation affected every person aboard equally.

Many social scientists assume that in a life-and-death situation self-interested reactions predominate. Social cohesion is expected to disappear, and the desire to act in accordance with self interests takes over (12, 13). In states of extreme privatization (14), 'the social contract is thrown away, and each man single-mindedly attempts to save his own life at whatever cost to others' (15). On the other hand, social norms are followed for intrinsic reasons; people believe them to be 'right' (16), or they fear social sanctions when violating them (17). The emerging disaster literature suggests that pro-social behavior predominates in such contexts (18). Laboratory experiments have shown that strategic incentives are important to understand whether self-regarding or other-regarding preferences dominate (19).

Our study proposes that context differences matter. Time appears to be a key parameter for explaining the adoption of either social or self-interested behaviors. Our results indicate that adherence to social norms and social power requires time to manifest (evolve) and cannot compete against individual self-interested flight behavior in a shorter window of opportunity

where competition for survival of the fittest prevails. The rapid sinking of the *Lusitania* very likely created a situation in which simple physical prowess and maybe also good fortune or randomness played a larger role, while social norms were much more influential in the case of the *Titanic*. To have more time at one's disposal, as in the case of the *Titanic*, may also have eased the restrictions on bargaining for lifeboats and facilitated information generating advantages, which may have benefited first- and second-class passengers when compared to third-class passengers (with the crew favoring the rich and powerful). The research on fight or flight behavior may also provide further insights into how people reacted in these different conditions. Fight or flight behavior, as the instinctual reaction to a perceived danger, has been discussed in different disciplines such as biology, psychology and sociology (20-23). Biologically, fight or flight behavior has two distinctly separate stages (24). The short-term response triggers a surge in adrenaline production via the hypothalamus and can last from a few seconds to a few minutes. This response is limited to a few minutes because adrenaline degrades rapidly and leaves the body in a state of exhaustion (25). The elevated operational state is maintained for a short period after the threat has passed, then the response mechanism switches off and the system returns to homeostasis (26). The duration extends beyond the active flight response time and includes a cool down period. Only after returning to homeostasis do the higher-order brain functions of the neo-cortex begin to override instinctual responses, which may lead to a change towards pro-social individual behaviors.

We were able to collect unique data sets containing detailed information about gender, age, ticket price and thus the passenger-class status for both the *Titanic* and the *Lusitania* with which to test these propositions. The dependent variable in the multivariate analysis is a 0/1 variable

that indicates whether an individual survived the disaster or did not survive (survived = 1). *Table 2* shows the estimated parameters, the significance level (indicated by z-values) and the quantitative (marginal) effects for the *Titanic* (T) and the *Lusitania* (L). The results focus only on passengers (without crew members).

Results

Table 2 about here

As the *Lusitania* sank in under 18 minutes, we expect a stronger competition for survival (of the fittest) than on the *Titanic*. People in their prime (ages 16 to 35) are expected to have higher survival probabilities. However, such a higher survival rate may not only be a result of a struggle for a place on a lifeboat, but also a result of an inefficient launching of lifeboats on the *Lusitania*. Individuals who were strong and agile enough to stay in the boats or to get back into the boats after being pitched into the water had a higher survival rate (7). The results of equation (1) in *Table 2* suggest that the age group 16–35 had a higher probability of surviving (7.9 percent for males and 10.4 for females) than other age groups. In contrast, on the *Titanic* only females in the reproductive age group 16–35 had a (48.3 percent) higher probability of surviving, thus supporting the importance of the procreation instinct (27). Conversely, the male age group 16–35 had a lower survival chance. Equation (2) of *Table 2* shows that the social norm of 'women and children first' was only deferred to in the case of the *Titanic*. Such a social norm was enforced by the crew members and seen as acceptable by the passengers. Otherwise, passengers could have easily revolted against such a protocol. In both disasters, the captains issued orders to their

officers and crew to follow the social norm of 'women and children first'. These orders were successfully carried out on the *Titanic*, but not on the *Lusitania,* as there were time restrictions and problems launching the lifeboats (10, 26). One should note that the Lusitania regressions have lower pseudo R2 values. This might be due to the rapidity of the sinking which induced lots of randomness into the survival process. Although it is certainly true that a higher pseudo R2 would be better, there is no reason to reject the model as we still have a clear confirmation that people in their prime (ages 16 to 35) have higher survival probabilities. Moreover, a global test of significance, testing the null hypothesis that all the coefficients are 0, can clearly be rejected (see Table 2).

Discussion

Children had a 14.8 percent higher probability of surviving than adults, and a person accompanying a child had a 19.6 percent higher survival chance than a person without a child. Moreover, being female increased the probability of surviving by more than 50 percent. These results suggest a stronger competition for survival (of the fittest) in the *Lusitania* case. In the environment of the *Titanic*, social norms were enforced more often, and there was also a higher willingness among males to surrender a seat on a lifeboat.

Economic class or social power warranted a relative advantage. First-class passengers, and to some extent also second-class passengers, tried to secure the same preferential treatment with respect to lifeboat access that they were used to receiving on the vessel. However, the generation of such a relative advantage takes time. Indeed, *Table 2* shows a higher survival rate for the *Titanic*, but not the *Lusitania* where first-class passengers fared even worse than those in

third class. The question remains whether the structure of the ship biased such results. One should note that there were no restrictions of any passenger movements including steerage. Crew members made their way through steerage calling out and warning passengers shouting "*All up on deck!"* A gate was temporally locked, however, this was rectified and the steerage passengers had per se as much opportunity to survive as both 1st and 2nd class passengers (7).

Our empirical analysis suggests that the adoption of a specific behavior might depend on time as a factor, although one should note that time may not be the only factor at work. Such a natural environment is less controlled than an experimental setting. In other words, there can be no absolute proof of the hypothesis that only time led to such behavioral differences. Ideally, one would need more observations (comparable shipwrecks) to better isolate the potential relevance of time. However, it seems that on the more slowly sinking *Titanic* pro-social behavior predominated (in a stronger manner), while a more selfish conduct prevailed on the rapidly sinking *Lusitania*.

Methods

Titanic Data

The Titanic data consist of 2,207 persons confirmed to be aboard the R.M.S. *Titanic*. The data was gathered from the *Encyclopedia Titanica* and crosschecked with other sources (28-36). The dependent variable is whether someone survived or not. Out of 2,207 passengers and crewmembers, 1,517 people died. Out of the 2,186 people onboard, 1,300 were passengers and 886 crewmembers. In the empirical part we will only focus on passengers. Among the passengers, 43 were servants, of the 2,186 aboard, 1,704 were male (78 percent), and 460 of the 1,300 passengers were female (35 percent). Aboard the *Titanic* lifeboats were a scarce commodity. The vessel only had 20 lifeboats, which could accommodate a maximum of 1,178 persons, or 52 percent of the people aboard. There were more

lifeboats than required by the rules of the British Board of Trade, which were drafted in 1894 and which determined the number of lifeboats by a ship's gross register tonnage, rather than the number of persons aboard. Because the *Titanic* at first did not show any signs of being in imminent danger, passengers were reluctant to leave the apparent security of the vessel to board small lifeboats. Consequently, in the beginning, most of the lifeboats were launched partially empty, which increased the demand for lifeboat places when the people on board later realized that the ship was indeed sinking.

Lusitania Data

The Lusitania data consist of 1,949 persons confirmed to be aboard the R.M.S. *Lusitania*. The data was gathered from numerous sources and crosschecked with other sources (7, 37,38). The dependent variable is whether someone survived or not. Out of 1,949 passengers and crewmembers, 1,313 people died. Out of the 1,949 people onboard, 1,258 were passengers and 691 crewmembers. Among the passengers, 19 were servants, of 1,949 aboard, 1,441 were male (73 percent), and 483 of the 1,258 passengers were female (38 percent). The shortage of life boats occurred not because of an original physical shortage of boats, but from an inability to launch all those available. Approximately 10 seconds after the torpedo struck, the vessel took on a heavy list to starboard (15 degrees), making it very difficult to launch the lifeboats on the port side (7) as they could not clear the rail. Additionally the starboard boats were difficult to enter for the entirely opposite reason, the lifeboats swung out too far making it difficult to load.

Additional Data and Definitions

Based on the records, we were able to gather information about the gender, age, nationality, port where people boarded, ticket price and therefore the passenger-class status (first, second, or third class). In addition, we were able to generate individual information related to travel plans and companions (having children). Because the impact of age is prominent in this investigation, it is important to use generally accepted groupings: children, adults, and older people. The United Nations standard for age (39) which classifies children as being fifteen years of age or under is used. In humans, the peak reproductive age, as defined by the American Society for Reproductive Medicine (40), is between 15 and 35 years of age.

Analytic Method

We use a probit model of the survival probability for a typical passenger:

$$\Pr(y = 1 \mid x_1, x_2, \ldots, x_k) = \Phi(\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k).$$

Here y is a dummy variable indicating whether the passenger survived ($y = 1$) or not ($y = 0$); the variables (x_1, x_2, …, x_k) are explanatory variables such as gender, age, etc; (α, β_1, β_2, … β_k) are parameters to estimate; and Φ is the cumulative standard normal distribution function. The role of Φ, which is increasing in its argument, is to keep the probability $\Pr(y = 1)$ in the zero to one interval. Each passenger contributes one observation on (y, x_1, x_2, …, x_k). From a sample of such observations, assumed independent, the parameters can be estimated by maximum likelihood. This is a standard probit model (41,42). Since the coefficients are difficult to interpret directly, the marginal effect of a continuous explanatory variable x_j will, as usual, be interpreted through the partial derivative

$$\frac{\partial \Pr(y = 1 \mid x_1, x_2, \ldots, x_k)}{\partial x_j} = \beta_j \phi(\alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k),$$

evaluated at the means, where ϕ is the standard normal density function (not the cumulative density Φ). Since $\phi > 0$, the sign of the marginal effect is the same as the sign of β_j. For a discrete x_j, a difference rather than a derivative will be used in place of a partial derivative.

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